Applied Magnetic Resonance 2001 vol.20 N3, pages 307-315

EPR and Optical Spectroscopy of Impurities in Two Synthetic Beryls

Gaite J., Izotov V., Nikitin S., Prosvirnin S.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Two synthetic beryls (Al2Be3Si6O18) of different color (purple and blue-green) were studied with electron paramagnetic resonance (EPR) and optical spectroscopy. In both crystals, the known spectra of Cu2+ and Fe1+ were observed with the same relative intensity. In the purple sample heated at 700°C in hydrogen atmosphere, two different kinds of Mn2+ EPR spectra were observed. The main one is pseudoaxial, it arises from ions substituted for Al3+ at position 4c of the structure. The weaker one is more complex, it has orthorhombic symmetry and is characterized by an unusually large zero-field splitting (B2 0 = 741 · 10-4 cm-1) and an isotropic hyperfine constant A = 70 G. This spectrum arises from Mn2+ at position 6f in the structure, normally occupied by Be. From optics, the blue-green color arises from Cu2+, while the purple one is due to Mn3+.